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FUNGI FOUND ON TEXAS SLASH AND LOBLOLLY SEED

by

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Abstract

Seed submitted by the Texas Forest Service from a variety of sources was analyzed for the presence of external and internal seed fungi. Several pathogenic fungi were found including Botryodiplodia sp., and Fusarium sp. Percentage of seed with external fungi (untreated seed) was nearly 100% while internal colonization of seed ranged between 0% and 100%.

INTRODUCTION

Fungi are known to cause damage to almost all agricultural products and by-products. They cause significant amounts of damage to trees in the forest environment, seed orchard, and nursery. Until recently, however, no attempt has been made to determine or evaluate the presence and pathogenic potential of fungi carried on, or in, forest tree seed. This report details the results of laboratory screening of 25 seed lots submitted for testing by the Texas Forest Service.

METHODS

Using acidified Potato Dextrose Agar (A-PDA), prepared seed was plated. After a suitable incubation period, fungi present on the plates were identified. Seed in Texas seedlots were prepared for plating in three ways: 1) Seed plated entire and untreated; 2) whole seed soaked 10 minutes in 20% peroxide, rinsed and plated; and 3) seed washed whole in 70% alcohol, cut in half, seed coat removed, 1/2 endosperm soaked ten minutes in 10% chlorox, rinsed and plated.

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RESULTS

Whole untreated seed (Treatment 1) gave a high level of contaminant fungi, most commonly Aspergillus sp., Penicillium sp., and Pestalotia sp. The rapidity with which these common fungi over-ran the plates precluded other fungi from successfully colonizing the A-PDA. This process was discontinued after 13 lots were processed; specific data are not presented.

Tables 1 and 2 present the data derived from procedures 2 & 3. Processing eliminated the common superficial saprophytes. Other fungi, several pathogenic in other situations, were reported. These include a Botryodiplodia sp., Dendrophoma sp., two species of Fusarium, and others.

Fungi listed as Imperfects included species of Candida (L3), Cephalosporium (S4A), Dendrophoma (S5, S8), Geotrichum (S2, S3B, S7A), Helminthosporium (L8), Nigrospora (L5), Phomopsis (S4B L1), Sphaeropsis (S1, S4A, L6), Torula (L7), and Trichothecium (L6). Two Phycomycetes were identified; Phytophthora sp. (L1) and Rhizopus sp. (S6B, L4, 5, 7, 8). A sterile mycelium grew from L5 and bacteria from seed in S1 and L11.

Seed treated to remove external fungi were seen to have a fairly high (although variable) level of fungi present within the seed coat. Percentage of seed with internal fungi ranged between 8% (L1) and 98% (L12).

Virtually all lots were seen to have internal seed fungi (Treatment 3); percent affected varied between lots from 0 (L7 and L9) to 50% (L3).

DISCUSSION

Differences appear in the data, for example, Botryodiplodia sp. seems more common on slash pine seed than on loblolly pine seed while the reverse holds true for Penicillium sp. The exact biological meaning of these differences is unknown.

The high levels of known pathogens (Botryodiplodia sp. and Fusarium sp.) in seedlots S4A, S8, and to a slightly lesser degree S4B (figure 1), is of real concern. Percent pathogenic fungi present within the seed coat was 52, 40, and 28%, respectively. In other words, between 1/4 and 1/2 of all seed in these lots is contaminated with fungi known to be pathogenic. These same three lots show similar high levels of these pathogenic fungi in the endosperm (42, 24, and 28%, respectively).

Also of interest is the high level of unsound or empty seed in lots S4A (34%), S7B (34%), L1 (26%), and L3 (34%). This is expected to severely reduce the germination percentages of these seed lots, possibly to unacceptable levels.

	Aspergillus	Botryodiplodia	Chaetomium	Fusarium	Penicillium	Pestalotia	Trichoderma	Imperfects	Phycomycetes	Yeast	Unknown	Clean
S1	6	5	-	4	4	4	1	1	-	-	1	24
S2	11	1	-	5	14	3	13	-	-	-	2	4
S3A	13	2	-	6	8	-	3	-	-	-	-	20
S3B	-	1	-	-	2	6	1	1	-	-	-	39
S4A	1	16	3	10	3	1	6	4	-	-	4	4
S4B	13	6	-	8	9	4	8	-	-	-	-	4
S5	-	1	1	1	27	-	20	1	-	-	-	3
S6A	3	-	2	-	7	-	4	-	-	-	4	30
S6B	14	-	10	3	-	-	13	-	3	-	2	11
S7A	2	4	2	1	3	-	1	-	-	-	-	37
S7B	8	3	2	1	12	1	4	-	-	-	-	19
S8	-	13	-	7	1	-	1	15	-	-	1	13
TOTAL	71	52	20	46	90	19	75	22	3	0	14	208
AVERAGE %	11.8	8.7	3.3	7.7	15.0	3.2	12.5	3.7	.5	0	2.3	34.6
L1	1	-	-	3	-	2	-	1	1	-	1	41
L2	7	1	3	2	18	-	14	-	-	-	3	9
L3	1	-	-	2	9	1	1	1	-	-	-	35
L4	5	-	-	-	20	-	6	-	6	-	1	21
L5	1	-	1	1	3	2	6	1	2	-	1	32
L6	7	-	6	-	26	-	6	2	-	-	-	12
L7	2	-	4	4	17	-	6	1	1	-	2	19
L8	15	-	-	3	25	1	7	-	1	-	-	10
L9	5	-	1	2	23	-	6	3	-	-	5	6
L10	14	-	-	2	15	-	-	-	-	-	-	26
L11	8	-	-	2	20	-	1	1	6	-	-	22
L12	2	-	-	-	44	-	1	1	3	-	-	1
L13	-	-	-	1	32	-	2	1	-	-	-	15
TOTAL	68	1	15	22	252	6	56	12	20	0	13	249
AVERAGE %	10.5	.2	2.3	3.4	38.8	.9	8.6	1.8	3.1	0	2.0	38.3

Figure 1. Counts of fungi found inside the seed coat of slash (S) and loblolly (L) pine seed lots soaked for ten minutes in 20% hydrogen peroxide (Treatment 2). Note: Totals do not necessarily add to 50 (the number of seeds in each lot) or 100% since several seeds yielded more than one fungus.

	Aspergillus	Botryodiplodia	Chaetomium	Fusarium	Penicillium	Pestalotia	Trichoderma	Imperfects	Phycomycetes	Yeast	Unknown	Clean	Unsound or empty
S1	1	2	-	-	1	-	-	-	-	-	-	45	-
S2	-	1	-	2	1	-	-	1	-	-	-	45	1
S3A	-	-	-	1	3	3	-	-	-	-	1	41	-
S3B	-	-	-	2	-	-	-	-	-	1	-	47	-
S4A	-	12	-	9	-	-	-	-	-	-	3	26	17
S4B	-	13	-	1	-	1	-	1	-	1	-	26	7
S5	2	-	-	2	-	-	-	2	-	10	3	31	4
S6A	2	-	-	2	1	-	1	-	-	-	1	42	6
S6B	1	-	-	1	3	-	2	-	1	-	-	42	-
S7A	3	2	-	1	1	1	1	1	-	-	1	39	-
S7B	8	1	-	4	4	2	6	-	-	-	-	14	17
S8	1	6	-	6	1	1	-	1	-	1	-	33	4
TOTAL	18	37	0	31	15	9	10	6	1	13	9	431	56
AVERAGE %	3.3	6.2	0	5.2	2.5	1.5	1.7	1.0	.2	2.2	1.5	71.8	9.3
L1	1	-	-	1	2	1	-	-	-	-	2	30	13
L2	-	-	-	7	-	1	5	-	-	-	-	31	6
L3	1	-	-	2	3	1	1	-	-	-	-	25	17
L4	-	-	-	1	-	1	-	-	-	-	2	41	5
L5	1	-	-	-	4	-	-	-	-	-	-	44	1
L6	6	-	-	4	13	1	-	-	-	-	-	26	6
L7	-	-	-	-	-	-	-	-	-	-	-	50	-
L8	-	-	-	1	-	-	-	1	-	-	-	48	-
L9	-	-	-	-	-	-	-	-	-	-	-	50	-
L10	-	-	-	1	1	-	-	-	-	-	-	48	-
L11	-	-	-	-	-	-	-	-	-	-	3	47	1
L12	-	2	-	-	-	-	-	-	-	-	2	46	2
L13	-	-	-	-	-	-	-	2	-	-	2	46	1
TOTAL	9	2	0	17	23	5	5	3	1	0	11	532	52
AVERAGE %	1.4	.3	0	2.6	3.5	.8	.8	.5	.2	0	1.7	81.8	8.0

Figure 2. Counts of fungi found in the endosperm of slash (S) and loblolly (L) pine seed soaked for ten minutes in 10% chlorox (Treatment 3). Totals are not necessarily 50 (the number of seeds in each lot) or 100% since several seeds yielded more than one fungus.